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ANNUAL SUMMARY

PART C

STORMS AND DEPRESSIONS

CONTENTS

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S. K. BANERJI, D.Sc., O.B.E.,

Director General of Observatories

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PART C.

STORMS AND DEPRESSIONS.

I.—DEPRESSIONS AND CYCLONIC STORMS.

During the year 7 cyclonic storms and 4 depressions formed in the Bay of Bengal, 1 depression in the Arabian Sea and 5 depressions over land. The dates on which the storms were in existence and the greatest barometric depths observed during their life are summarised in the table below :—

Region	Month	Date	Greatest observed barometric depth
Bay of Bengal and Arabian Sea	May . . .	11th-23rd . .	14 mb.
Bay of Bengal .	July . . .	9th-15th . .	10 mb.
Do. . .	July . . .	24th-31st . .	12 mb.
Do. . .	September . .	19th-28th . .	9 mb.
Bay of Bengal and Arabian Sea.	October . .	3rd-14th . .	6 mb.
Bay of Bengal .	October . .	14th-20th . .	9 mb.
Do. . .	October—November	27th October—2nd November	15 mb.

The detailed descriptions of these storms and depressions are given first ; these are followed by a list of the western disturbances and important local storms during the year. The tracks of the disturbances over the sea are not definitely known as no data from ships have been available during the preparation of the account.

1. Severe Bay storm of the 11th to 23rd May 1943.—Temporary advance of the southwest monsoon into the southwest Bay of Bengal was indicated by locally heavy rain which fell in south Ceylon on the 8th May. The upper winds over Ceylon indicated a penetration of the monsoon current in the upper levels up to 1·5 km. above sea level on the next two days. On the 11th morning there was a trough of low pressure over the southwest Bay and a feeble cyclonic circulation was indicated in the upper air at 1·5 km. and above. Widespread thunder-rain fell over the extreme south of the Peninsula and in Ceylon during the next day. By the morning of the 12th a sharp fall of pressure and negative departures of pressure appeared over the south Coromandel coast and the upper winds over Ceylon and its neighbourhood showed a further strengthening of the monsoon. During the next 24 hours pressure continued to fall over the same region where precipitation was more or less continuous and locally heavy. The isobaric chart at 0900 hrs. of the 13th showed that a depression had formed in the southwest Bay with its central region about 200 miles to the east of Negapatam. The pressure deficiency at the centre of the disturbance was probably of the order of 6 mb. at this stage. During the next three days the depression moved very slowly westnorthwestwards intensifying at the same time. During this period there was at first widespread rain over the extreme south of the Peninsula but later it decreased in extent ; Negapatam recorded 13″ of rain in the 72 hours ending 0900 hrs. of the 15th.

By the morning of the 16th the depression had intensified into a cyclonic storm with central region near Lat. 11½°N., Long. 81½°E. The synoptic data of the 16th morning revealed a concentrated negative pressure change and departure along the Coromandel coast and north Ceylon where the coastal stations reported moderate to rough seas with moderate swell of average length. The pilot balloon ascent at Madras indicated fresh to strong gales up to 2 km.—the limit of the ascent at this stage. The pressure deficiency at the centre would have been about 10 mb. The cyclonic storm continued to intensify and move in a westnorthwesterly direction and by the early hours of the 17th it had become severe with centre about 70 miles to the east of Cuddalore. At 0900 hrs. of the 17th Cuddalore was reporting a pressure departure of 14 mb. The sea at Madras was very rough with a heavy long swell. Moving slowly in a westnorthwesterly direction, the storm at 0900 hrs. of the 18th was close to the coast nearly midway between Cuddalore and Madras. The pressure deficiency at Cuddalore and Madras were 11 mb. and 12 mb. respectively. The storm crossed the coast about 60 miles to the south of Madras during the afternoon of the 18th and was centred to the east of Vellore near Lat. 12½°N., Long. 79½°E. on the next morning. Madras experienced easterly to northeasterly fresh gales on the 16th and 17th. Between the mornings of the 18th and 19th, the average wind velocity at Madras was 45 miles an hour but it rose to 50 miles an hour or more, for short periods. Even after the storm moved inland, it was blowing moderate fresh gales at Madras.

The summary of weather conditions experienced at Madras from the 17th to 19th is given at the end.

The storm weakened while passing over the Mysore plateau on the 20th and suffered further weakening on crossing the Western Ghats. However, on the evening of the 21st

it emerged into the Arabian Sea off Honavar as a deep depression and was centred near Lat. 14½°N., Long. 73½°E. on the next morning. The depression showed signs of intensification as it moved northwestwards off the Konkan coast. It was centred at 9 hrs. of the 23rd within a degree of Lat. 15½°N., Long. 73°E. and on the evening about 100 miles to the west of Ratnagiri. At this stage the feed of the moist winds from the south ceased and air from the north was pouring into the depression; so it rapidly weakened and became unimportant by the morning of the 24th.

The storm had an unusual course for this month and resembled the storm of May 1909 which crossed the south Coromandel coast and later gave rise to a disturbance in the Arabian Sea.

The rainfall associated with the storm was widespread and unusually heavy in the south Madras and in Mysore between the 17th and 20th. Thereafter the rain-belt shifted northwestwards towards the Konkan along with the storm and was confined to the west coast on the 23rd and 24th. The amount of rainfall may be gauged from the district averages given below :—

District	District averages recorded on				Normal for the whole month
	17th	18th	19th	20th	
	"	"	"	"	"
Chingleput	5·4	1·9	..	..	1·4
South Arcot	4·9	10·9	6·2	..	1·9
North Arcot	3·1	3·5	5·3	2·0	2·7
Chittoor	..	2·6	5·1	3·0	2·3

Some of the noteworthy amounts of rainfall were—Negapatam 6·0" (12th), 4·2" (13th) and 3·8" (17th); Cuddalore 9·9" (16th), 22·5" (17th) and 5·1" (18th); Madras 8·5" (16th) and 3·5" (19th); Vellore 5·5" (19th) and Pondicherry 45" in four days from the 15th to 18th.

The rainfall of 22·5" on the 17th at Cuddalore is a record for a plain station in the Madras Province.

The gales accompanied with very heavy rain caused enormous damage in the districts of Madras, Chingleput and South Arcot; irrigation tanks were damaged, particularly in the South Arcot district. Telegraph and telephone lines and railway communications were interrupted. Due to considerable rise in the water level of rivers and the bursting of tanks, low-lying areas were inundated, crops were damaged and many people rendered homeless by the collapse of their houses.

Extracts from the Weather Diary of Madras :—

"*17th May.*—Continuous light rain from midnight to 1730 with moderate rain between 0430 and 0715. Squall at 0405 from NNE, wind force rose from 5 to 8. Total rain for 24 hours ending 9 hrs. was 8·46". Intermittent light rain from 1730 to midnight. Wind continued to be strong and gusty with velocity ranging from 30 to 40 m.p.h. from NE. Cups of anemometer at the harbour blown off due to very high winds.

"*18th May.*—Intermittent light rain and drizzle practically whole day and night. Winds strong and velocity increased from 0300 hrs. rising to 50 m.p.h. at times and remained so till 14 hrs. but decreased to about 36 m.p.h. by 21 hrs. and again increased, the highest velocity of 56 m.p.h. was reached at 2230 hrs. Winds began to weaken after midnight, still velocity of about 30 m.p.h. persisted. From noon direction changed from NE to ENE and again changed to E at about 22 hrs. Squall from east at 2250 force rose from 5 to 9.

"*19th May.*—Intermittent drizzle and rain from midnight to 1915. Squall at 1740 from SE, force 8; continuous moderate rain from 1935 to 2045 and intermittent light rain from 2200 to midnight. Wind began to change from E to ESE at midnight and from 0400 it was from SE or SSE; changed to SSW at 1630. The velocity remained at about 30 m.p.h. with gusts occasionally rising to 40 m.p.h."

2. Shallow depression of 30th May to 3rd June 1943.—On the morning of the 29th May the trough of low pressure over the Gangetic Valley extended into the north Bay of Bengal and by the same evening a feeble cyclonic circulation in the upper air was noticed round the head of the Bay of Bengal. By the morning of the 30th a low pressure area appeared off the Circars-Orissa coast, which concentrated into a depression with its central region near Lat. 20°N., Long. 89°E. at 0900 hrs. of the 31st. Moving in a northwesterly direction the depression was centred about 40 miles to the south of Calcutta at 0900 hrs. of the 1st June. Thereafter the depression took a northerly course and was centred to the east of Malda on the next morning. Continuing to move in a northerly direction it became unimportant by the morning of the 3rd. Associated with this depression there was widespread and locally heavy rain in Bengal, north Bihar and Assam during the period 31st May to 3rd June. The district averages of rainfall with particularly heavy falls on any day during the period are given in the following statement :—

District	District averages recorded on			Particularly heavy falls (5" and above)
	1st June	2nd June	3rd June	
	"	"	"	
Howrah . . .	2·5	..	..	
Rajshahi . .	..	2·1	..	
Dinajpur . .	..	3·7	1·9	Balurghat 13·7", Gangarampur 8·5" and Nithpur 6·1" on 2nd; Hahar 5·5" on 3rd.
Jalpaiguri . .	2·1	2·4	2·0	Panchibibi 6·6" and Alipore Duars 5·9" on 1st.
Darjeeling . .	..	1·5	4·6	Mongpoo 7·2" and Kurseang 6·3" on 3rd.
Rangpur . .	1·7	2·7	..	
Bogra . . .	1·6	1·7	..	
Mymensingh . .	..	1·8	..	
Pabna . . .	1·7	..	..	
Purnea . . .	..	1·8	1·6	
Goalpara . .	2·0	2·2	1·6	
Khasi & Jaintia Hills	..	..	3·3	Cherapunji Police Station 8·6" and Cherapunji welsh 6·0" on 3rd.

3. Bay Storm of 9th to 15th July 1943.—On the morning of the 9th July conditions were markedly unsettled over the northwest Bay and by the same evening both the isobaric and the upper wind charts showed that a depression had formed in the north Bay with central region near Lat. 20°N., Long. 88½°E. During the next 24 hours the depression moved slowly northwestwards intensifying at the same time into a cyclonic storm with central region at 18 hrs. I.S.T. of 10th near Lat. 20°N., Long. 88°E. Moving in the same direction the storm passed inland on the morning of 11th and lay as a deep depression centred at 0900 hrs. I. S. T. near

Balasore. By 18 hrs. of the same day it weakened into a depression with centre about 50 miles to the southwest of Chaibasa. Thereafter moving westnorthwestwards it was centred near Pendra on the morning of the 12th; then it again moved northwestwards and on the evening of the same day was centred near Umaria. On the morning of the 13th its centre lay between Sutna and Saugor and on the next morning it weakened to a shallow "low" lying over Rajputana, where it persisted till the 15th morning; it merged into the seasonal low over northwest India by the evening of the 15th.

The depression caused widespread and locally heavy rain over the region extending from Chota Nagpur and Orissa to Gujarat and Rajputana. The rainfall also extended into the United Provinces, the Punjab and the northwest frontier. The following table gives the details of the noteworthy district averages and also of particularly heavy rainfalls that occurred at individual stations.

District	District averages recorded on				Particularly heavy falls (7" and above)
	11th	12th	13th	14th	
	"	"	"	"	
Cuttack	3·8	..	..	..	Jagatsingpur 12·5", Cuttack 8·3", Kendrapara 7·3" and Barchana 7·0" on 11th.
Puri	2·1	..	..	..	Tanghi 8·7" on 10th; Gop 7·5" on 11th.
Gaya	..	..	..	..	Gaya 7·7" on 10th.
Drug	..	2·4	..	..	Kharra 7·1" on 12th.
Raipur	..	3·0	..	..	Baloda Bazar 8·7", Kukerdehi 8·3" and Kharidatan 7·4" on 12th.
Bilaspur	..	2·9	..	..	
Bhandara	..	2·2	..	..	
Balaghat	..	3·1	..	..	Fagla 7·8" on 12th.
Hoshangabad	..	2·4	..	..	Mohpani 7·5" on 12th.
Chhindwara	..	..	4·8	..	Harrai 9·8", Tamia 8·9" and Lakhnadon 7·5" on 13th.
Mahidpur	..	..	..	2·4	
Bhopal State Eastern District.	..	..	3·3	..	
Bhopal State Western District.	..	..	3·0	..	
Partabgarh	..	..	2·1	3·5	
Kusalgarh	..	..	..	3·4	
Sirohi	..	..	..	2·7	

4. Land depression of 15th to 21st July 1943.—The cyclonic storm which crossed the Orissa-Bengal coast on the 11th July, caused vigorous monsoon during the latter half of the second week of July over south Bengal, where there was widespread and locally heavy rainfall between the 13th and 15th. The isobaric and the upper wind charts up to 4 km. (limit of pilot balloon ascents) on the morning of the 15th showed a shallow low over central Bengal, which persisted there up to the morning of the 17th. On the evening of the 17th, it concentrated into a depression with centre at 18 hrs. I.S.T. about 30 miles to the west of Calcutta.

Subsequently the depression deepened but its centre moved southeastwards and on the morning of the 18th it was centred about 50 miles to the southeast of Calcutta. From this position it moved northwestwards and was centred about 30 miles northwest of Calcutta on the evening of the 18th. Thereafter it slightly weakened into a depression and moved nearly westwards. On the morning of the 19th it was centred between Ranchi and Daltonganj and by the next morning was centred between Umaria and Sutna having weakened further. By the morning of the 21st it merged into the seasonal low over northwest India.

The depression caused widespread and locally heavy rain from Bengal to Rajputana. The rainfall associated with this depression and the preceding cyclonic storm caused floods in the Damodar river in southwest Bengal. A large breach was caused in the river embankment in the Burdwan district which led to inundation of the adjoining areas; several villages were submerged in water and railway lines were washed away, causing a serious dislocation in railway traffic.

The noteworthy district averages of rainfall and some of the heavy falls are given in the following table:—

District	District averages recorded on					Particularly heavy falls (6" and above)
	14th	15th	16th	17th	18th	
	"	"	"	"	"	
Murshidabad	..	..	2·2	..	..	
Burdwan	..	2·5	5·1	2·5	..	Asansol 10·6" on 16th.
Birbhum	..	3·4	4·5	..	..	Hetampur 11·7" on 16th.
Bankura	..	2·0	2·4	..	..	
Hooghly	..	2·8	..	..	..	
Pabna	..	2·2	..	..	..	
Hazaribagh	..	..	2·8	2·9	..	
Singhbhum	..	..	..	..	2·6	
Manbhum	..	..	3·7	..	..	Katras 10·0", Dhanbad 7·5", Topchanchi 7·8" and Gobindpur 6·1" on 16th.
Santal Parganas	..	..	..	..	..	Kundahit 7·0" on 16th and 7·3" on 17th.

5. Land depression over the Central Provinces and Kathiawar between the 10th and 13th July 1943.—On the morning of the 10th July a discontinuity in wind field with a feeble cyclonic circulation was observed in the upper air over the Central Provinces up to 2·0 km., and the pressure was falling over the west Central Provinces and west Central India. By the evening of the same day a shallow low pressure area appeared between Pendra and Jubbulpore and the pressure was found to fall from west Central India to Gujarat. The low pressure area rapidly moved westwards and was over Kathiawar on the 11th morning when moderate to rough seas with strong winds and rain were recorded along the Kathiawar coast and a depression formed near Rajkot by the 12th morning. It intensified and persisted there for nearly one day, but weakened later and moved northnorthwestwards and was between Deesa and Umarkot on the 13th morning. On the next day it merged into the seasonal low over northwest India and became unimportant. The depression caused widespread and locally heavy rain in the central parts of the country, southeast Rajputana and Kathiawar between the 9th and 12th. The following

statement gives some of the noteworthy district averages and heavy falls associated with this disturbance.

District	District averages recorded on				Patricularly heavy falls (7″ and above)
	9th	10th	11th	12th	
	″	″	″	″	
Bhilsa . . .	..	..	..	2·8	
Ujjain . .	..	4·0	..	..	
Mahidpur . .	..	3·0	...	..	
Dewas (Junior) .	..	..	..	4·2	
Drug . . .	..	..	..	2·4	Khara 7·1″ on 12th.
Raipur . .	..	..	..	3·0	Baloda Bazar 8·7″, Kukerdehi 8·3″ and Khandotan 7·4″ on 12th.
Bilaspur . .	..	..	..	2·8	
Saugor . .	..	2·1	..	..	
Balaghat . .	2·8	2·6	..	..	Fagla 7·5″ on 10th, and 7·8″ on 12th.
Hoshangabad .	..	2·3	..	2·3	Mohpani 7·5″ on 12th.
Betul . . .	..	2·4	..	..	
Chhindwara . .	..	2·4	..	..	
Kathiawar . .	..	..	4·0	..	Rajkot 7·2″ on 11th; Dwarka 8·6″ on 12th.
Amraoti . .	..	..	..	..	Chikalda 7·3″ on 11th.

6. Bay cyclonic storm of 24th to 31st July 1943.—On the morning of the 22nd July a trough of low pressure appeared over the northwest Bay of Bengal where the upper winds up to 2 km. (limit of available pilot balloon observations) showed a cyclonic circulation indicating that conditions in the north Bay were unsettled. By the morning of the 24th the unsettled conditions had concentrated into a depression with its central region at 9 hrs. I.S.T. near Lat. 19½°N., Long. 89½°E. Moving westnorthwestwards the depression rapidly intensified into a cyclonic storm centred near Lat. 20°N., Long. 88°E. at 0900 hrs. of the 25th. The storm continued to move in the same direction and by the evening was centred near the coast just to the south of Chandbali. By midnight it crossed the coast and lay as a deep depression, centred near Angul on the next morning. The depression continued its westnorthwesterly course and was centred between Pendra and Umaria on the 27th morning. Next it moved northwestwards and was centred near Jhansi on the 28th morning. Thereafter, it again moved towards westnorthwest; on the 29th morning its centre was at a distance of 70 miles nearly to the west of Gwalior and on the 30th morning at a distance of 60 miles to the northwest of Ajmer. Thereafter it merged into the seasonal low over Sind.

The Arabian Sea branch of the monsoon continued to be strong throughout the period. The rainfall associated with the storm was widespread over northern and central India and extended westwards to Sind and the northwest frontier. Rainfall was particularly heavy in the Aravallis. Abu observatory recorded a phenomenal fall of 34 inches during the 72 hours ending at 0900 hrs. of the 31st.

The following is an extract from the "*Times of India*" of the 10th August regarding the floods in Rajputana :—

"On the western side of India disaster has overtaken the heart of Rajputana, famous in India's annals for many things, but not for floods. Rajputana's annual rainfall is normally about 19 inches; the phenomenal figure of about 30 inches experienced in one day in the hills of Mewar and Marwar caused an unprecedented flood in the river Khari, which runs along the southeastern corner of Ajmer-Merwara. The devastation is described as without parallel in the history of Rajputana, that land of chivalry and romance. About fifty villages were devastated, leading to a loss of life at present estimated at about 5,000. According to the Chief Commissioner of Ajmer-Merwara, the small industrial town of Vijainagar, with a population of about 7,000, lost more than half its inhabitants. Rajputana is ill-provided against floods of this type, which breached a whole series of bunds and tanks unaccustomed to torrential waters."

Some of the noteworthy district averages and heavy falls are given in the following table :—

District	District averages recorded on						Particularly heavy falls (7″ and above)
	26th	27th	28th	29th	30th	31st	
	″	″	″	″	″	″	
Cuttack . .	2·7	..	..	..	..	..	
Puri . .	3·4	..	..	..	..	..	Gop 11·8″ and Khurda 9·0″ on 26th.
Sambalpur .	2·1	..	..	..	..	..	
Ganjam . .	2·7	..	..	..	..	..	Phulbani 8·7″ and Khejuripara 7·6″ on 26th.
Drug . .	..	2·8	..	..	..	..	
Raipur . .	..	2·4	..	..	..	..	Kusrangi 7·2″ on 27th.
Bilaspur . .	..	2·2	..	..	..	..	Kharia 9·5″ on 27th
Saugor . .	..	..	2·3	..	..	..	
Jubbulpore .	..	..	2·6	..	..	..	
Mandla . .	..	..	2·7	..	..	..	
Balaghat . .	..	3·4	..	..	...	..	Fagla 7·1″ on 27th.
Goona . .	..	3·3	2·4	..	..	..	
Bhilsa . .	..	4·9	..	..	..	..	
Ujjain . .	..	..	2·1	..	..	..	
Shajapur . .	..	..	3·8	..	..	..	
Mandsaur .	..	..	2·5	4·9	..	..	Jawad 9·3″ on 29th.
Sardarpur .	2·7	..	..	..	..	..	
Indore . .	..	2·0	..	..	..	..	Manasa 7·1″ on 29th.
Nimar . .	..	2·2	..	..	•.	..	
Rampura . .	..	..	..	8·5	3·3	..	
Mahidpur . .	..	..	4·2	..	..	..	
Bhopal Eastern Dist.	..	..	2·1	..	..	..	Rajgarh (Tehsil) 7·3″ and Biaora (Dispensary) 7·1″ on 28th; Rajgarh (Hospital) 9·3″ and Biaora (Dispensary) 7·1″ on 29th.
Bhopal Western Dist.	..	..	2·3	..	..	..	Khujner 8·3″ on 28th.
Narsimgarh .	..	..	5·5	3·1	..	..	
Rajgarh . .	..	..	5·1	4·4	..	..	
Dewas Junior .	..	3·3	2·9	..	..	..	

District	District averages recorded on						Particularly heavy falls (7" and above)
	26th	27th	28th	29th	30th	31st	
	"	"	"	"	"	"	
Kurwai	..	4·0	2·5	..	..	..	
Khilchipur	..	..	6·6	4·1	..	..	
Pathari State	..	2·4	..	..	..	..	
Mohamedgarh	..	3·1	..	..	..	..	
Malwa Agency	..	..	..	2·5	..	..	
Palanpur State	..	..	..	2·8	6·5	..	Palanpur 6·5" on 30th.
Metra	..	..	..	..	..	2·1	
Pali	..	..	..	..	3·2	..	
Ajmer-Merwara	..	..	..	..	3·1	..	Todgarh 12·9" on 30th.
Kotah	..	..	..	2·3	..	..	Bakani 8·9", Chipabarod 8·5" and Sahabad 7·6" on 29th.
Baran	..	..	..	4·3	..	..	
Iklera	..	..	..	7·2	..	..	
Tonk	..	..	..	4·1	..	..	Pirwara 7·7" on 29th.
Shahpura	..	..	..	4·3	..	..	
Bundi	..	..	..	3·9	..	..	
Deoli	..	..	..	4·5	..	..	
Jhalawar	..	..	..	7·4	..	..	Bhawaniganj 12·1" and Brijnagar 7·1" on 29th.
Udaipur	..	..	..	4·1	..	..	Dawer 10·3" on 30th.
Jaisalmer	..	..	..	..	..	..	Lakhan 8·0" on 31st.
Dungarpur	..	..	..	2·3	..	..	
Sirohi	..	..	3·3	6·0	7·2	3·1	Abu Road 9·4" on 28th and also on 29th.

7. Bay depression of 29th July to 3rd August 1943.—On the morning of the 28th July a fall of barometric pressure was noticed over southeast Bengal, north Bengal and Assam and on the morning of the 29th there was a marked fall of pressure over the coastal regions of Bengal and east Orissa. On the morning of the 30th, the surface isobaric and the upper wind charts up to 2 km. (limit of pilot balloon ascents) showed that a cyclonic circulation was being established over the northwest Bay of Bengal where conditions were unsettled. By the morning of the 31st the unsettled conditions developed into a depression centred at 9 hrs. I.S.T. near Lat. 20°N., Long. 90°E. Moving northwestwards, the depression was centred about 50 miles south of Calcutta at 18 hrs. I.S.T. On the morning of the 1st August it was centred about 50 miles to the southwest of Calcutta. Moving in the same direction, the depression crossed coast during the course of the day and was centred about 50 miles to the west of Calcutta at 18 hrs. Next morning it weakened and was centred about 70 miles to the east of Ranchi. It remained practically stationary there for a day and apparently filled up, but was very soon followed by a depression which formed over south Bengal on the 4th.

In association with this disturbance the monsoon considerably strengthened over northeast India, the United Provinces and in the centred parts of the country. Locally heavy rain occurred in Orissa, Chota Nagpur, Bihar and the United Provinces. The district averages of rainfall as well as some noteworthy falls are given in the following statement :—

District	District averages recorded on				Particularly heavy falls (7" and above)
	31st July	1st Aug	2nd	3rd	
	"	"	"	"	
Cuttack	2·5	2·7	..	..	
Balasore	..	3·2	..	..	Soro 18·9" and Eram 7·9" on 1st Aug.
Puri	3·2	..	..	..	Gop 8·5" and Khurda 7·4" on 31st July.
Singbhum	..	2·1	..	2·1	
Hazaribagh	..	..	..	..	Chatra 8·9" on 3rd Aug.

8. Land depression of 3rd to 10th August 1943.—Immediately following the preceding depression a deep one appeared over south Bengal centred at 9 hrs. I.S.T. about 70 miles to the southeast of Calcutta. Moving northwestwards, it was centred just to the south of Calcutta at 18 hrs. of the 4th ; then it moved westsouthwestwards and on the next morning it was centred about 50 miles to the southwest of Calcutta. Moving again northwestwards it was centred about 30 miles to the south of Asansol at 18 hrs. of the 5th. Thereafter the deep depression weakened and lay near Gaya on the morning of the 6th. From this position the depression moved westnorthwestwards ; on the 7th morning it was centred about 60 miles to the eastnortheast of Allahabad and on the 8th morning about 50 miles to the east of Cawnpore ; subsequently it further weakened and moving slowly northwestwards disappeared over the Simla hills on the 10th on which date a shallow low appeared over east Central India.

The depression caused vigorous monsoon over the north Bay of Bengal on the 4th and 5th. It also caused widespread and locally heavy rain over the belt of country from Bengal and Orissa to the west United Provinces. Some of the noteworthy falls as well as the district averages are given below :—

District	District averages recorded on						Particularly heavy falls (7" and above)
	4th	5th	6th	7th	8th	9th	
	"	"	"	"	"	"	
Balasore	2·4	..	..	..	..	..	Baliapal 8·2" and Soro 7·6" on 4th.
Midnapore	2·7	2·7	..	..	..	..	Kharagpur 7·3" and Contai 7·0" on 4th ; Nayabasan 12·3" and Narayangarh 8·1" on 5th.
Singbhum	2·5	5·6	..	..	..	..	Sonua 9·4", Gailkura 8·9", Majhgaon 7·5" and Chaibasa 7·3" on 5th.
Manbhum	..	2·2	..	..	..	..	
Ranchi	..	2·4	..	..	..	..	
Hazaribagh	..	2·1	..	..	..	..	
Palamau	..	..	3·2	..	..	..	Panki 7·3" on 6th.
Allahabad	..	..	..	3·8	..	..	
Fatehpur	..	..	..	3·5	..	..	
Cawnpore	..	..	..	3·3	..	..	
Etawah	..	..	..	3·1	..	..	
Farrukhabad	..	..	..	2·7	..	..	
Jalaun	..	..	..	2·5	..	..	

District	District averages recorded on						Particularly heavy falls (7″ and above)
	4th	5th	6th	7th	8th	9th	
	″	″	″	″	″	″	
Hamirpur	..	..	..	3·6	..	..	Hamirpur 10·0″ on 7th.
Banda	..	..	..	2·6	..	..	
Rampura-Bhanpura.	..	..	..	..	2·6	..	
Bulandsher	..	..	..	..	3·6	..	
Etah	..	..	..	..	2·1	..	
Budaun	..	..	..	..	2·1	3·0	
Aligarh	..	..	..	..	..	2·6	Balanpur 8·0″ on 8th.
Moradabad	..	..	..	..	..	2·6	
Dehra Dun	..	..	..	..	..	3·1	

9. Land depression over Central India on the 10th and 11th August 1943.—On the 9th evening a feeble cyclonic circulation was found in the upper air over east Central India and the east United Provinces up to about 3·0 km. A shallow land depression formed over east Central India on the next morning, centred about 50 miles to the east of Sutna. Pressure was falling from east Central India to the east United Provinces. The depression weakened and moved in a northnorthwesterly direction and was near Lucknow on the 11th morning and broke up on the United Provinces hills by the next day. In association with this depression fairly widespread and locally heavy rain fell in the central parts of the country and the United Provinces between the 9th and 11th. Some of the district averages and heavy falls are given below :—

District	District averages recorded on			Particularly heavy falls (8″and above)
	10th	11th	12th	
	″	″	″	
Bundelkhand	2·4	..	..	Orchha 9·7″ on 10th.
Northern Rewa	3·0	..	..	
Southern Rewa	2·6	..	..	
Eastern Rewa	2·2	..	..	
Saugor	3·6	..	..	
Jubbulpore	3·0	..	..	
Mandla	3·1	..	..	
Jhansi	2·1	..	..	
Jalaun	2·5	..	..	
Banda	2·1	3·9	..	
Gonda	2·2	..	..	
Dehra Dun	..	3·6	..	
Farrukhabad	..	2·1	2·6	
Etawah	..	2·2	..	
Cawnpore	..	2·8	..	
Fatehpur	..	2·5	..	
Jhelum	..	2·4	..	
Hamirpur	..	3·1	..	Khannah 8·5″ and Hamirpur 8·1″ on 11th.
Jaunpur	..	2·3	..	
Unao	..	3·0	..	
Rae-Bareli	..	3·3	..	
Partabgarh	..	3·0	..	
Hardoi	..	..	2·6	
Fyzabad	..	..	2·6	

10. Bay depression of 20th to 23rd August 1943.—Weather became unsettled at the head of the Bay of Bengal on the 20th morning and the upper air showed an area of convergence over southwest Bengal up to 2·0 km. By the evening of the same day a shallow depression formed very near Calcutta. By the next morning the depression intensified and was over Chota Nagpur centred between Ranchi and Chaibasa. The upper air circulation intensified further over Chota Nagpur and east Central India and the depression moved northwestwards and was over east Central India on the 22nd morning, centred about 50 miles to the east of Sutna. Moving westwards it was about 50 miles to the west of Sutna on the next morning, and became unimportant on the 24th morning.

The depression caused widespread and locally heavy rain in Bengal, Chota Nagpur, the east Central Provinces and the adjoining districts of Orissa between the 20th and 23rd. Some of the district averages and heavy falls are given below :—

District	District averages recorded on		Particularly heavy falls (7″ and above)
	21st	22nd	
	″	″	
Drug	3·5	..	Garlabund 11·9″, Dhamtari 8·6″, Rudri 7·8″ and Maramsilli 7·2″ on 21st.
Raipur	4·0	..	
Bhandara	..	2·2	
Balaghat	..	2·1	

11. Shallow depression in the Bay of Bengal from the 28th August to 4th September 1943.—A cyclonic circulation appeared in the upper air up to 6 km. off the Circars-Orissa coast on the 27th morning and the weather became slightly unsettled there by the same evening. Pressure gradually fell along and near the Orissa coast and by the 31st morning a shallow depression developed with its centre near Lat. 18°N., Long. 88°E. It passed inland on the next day and lay as a shallow low pressure area over the north Central Provinces. The 'low' weakened on the 3rd September; but the circulation in the upper air persisted. By the 4th morning the 'low' had reintensified, and was over the west United Provinces and east Rajputana. Later it filled up during the course of the day.

During its passage widespread rain occurred in the west Central Provinces, west Central India, the west United Provinces, east Rajputana, parts of Gujarat and in the east and north Punjab. Some noteworthy amounts of rainfall were :—September 2, Yeotmal (C.P.) 5·2″; 3rd, Gurgaon (Punjab) 6·4″; 4th, Moradabad (U.P.) 5·4″.

12. Cyclonic storm in the Bay of Bengal of the 19th to 28th September 1943.—On the morning of the 19th the upper wind charts showed a cyclonic circulation over the northwest and west central Bay and pressure began to fall over Bengal by the next morning. The isobaric chart of the 21st morning indicated a 'low' over the northwest and west central Bay and conditions were becoming favourable for the formation of a depression in the region. By the morning of the 22nd a depression had formed with its central region at 9 hrs. I.S.T. near Lat. 19°N., Long. 89°E., and by that evening it intensified into a cyclonic storm with

centre at 18 hrs. I.S.T. near Lat. 19½°N., Long. 88½°E. At that time Sandheads recorded a negative pressure departure of 9 mb. Moving northwestwards the cyclonic storm was centred at 9 hrs. of the 23rd near Lat. 21°N., Long. 87½°E. and crossed coast just to the east of Balasore during the afternoon. Subsequently the storm weakened into a deep depression centred at 18 hrs. about 10 miles north of Balasore. Thereafter, it moved westwards and at 9 hrs. of the 24th was about 60 miles to the west of Chaibasa. It weakened further and moving northwestwards lay as a depression near Daltonganj on the 25th morning. Next morning it was near Benares, wherefrom it recurved and moved eastwards towards Bihar. It was centred near Patna on the 27th morning and near Cooch Behar on the 28th morning. Thereafter, it moved towards the Himalayas and broke up.

The storm caused widespread and locally heavy rain between the 23rd and 28th in northeast India and in parts of the east United Provinces. The river Varuna which joins the Ganges at Benares was flooded and caused considerable damage to standing crops and property in the adjoining areas. The flood level is said to have been the highest on record in Benares, the last highest being in 1882. According to newspaper reports the city itself was partially affected, about 50 houses collapsing in one mohalla alone. Boats, it is reported, were plied on some roads. The Tehsil Treasury building occupied by the Zoological Survey of India and several bungalows in its neighbourhood were affected. In the adjacent districts of Jaunpur and Mirzapur the floods caused heavy damage to crops and property. Government stores of grain worth about Rs. 10 lakhs are reported to have been damaged by the flood water.

Some of the noteworthy district averages and heavy falls are given in the following statement:—

District	District averages recorded on				Particularly heavy falls (7″ and above)
	25th	26th	27th	28th	
	″	″	″	″	
Benares	..	5·3	..	..	Benares 13·8″ on 26th.
Mirzapur	3·8	4·3	..	..	Mirzapur 9·9″ on 26th.
Jaunpur	..	9·9	4·8	..	Shahganj 12·0″, Kerakat 10·0″, Jaunpur 10·0″, Mahiahu 8·4″, and Machlishahr 8·1″ on 26th; Kerakat 11·7″ on 27th.
Ghazipur	..	2·8	2·3	..	
Ballia	..	..	3·4	..	Rasra 10·0″ on 27th.
Gorakhpur	..	..	2·4	..	Salimpur 7·0″ on 27th.
Azamgarh	..	4·7	6·6	..	Mahul 10·5″ on 26th; Deogaon 9·9″, Jiwanpur 9·1″ and Ghosi 7·7″ on 27th.
Sultanpur	..	3·1	..	..	
Partabgarh	..	4·1	..	..	
Allahabad	..	3·7	..	..	
Purnea	..	..	2·6	..	
Jalpaiguri	..	..	5·3	4·3	Alipore Duars 10·5″ on 27th; Jalpaiguri 7·4″ on 28th.
Darjeeling	..	..	2·2	2·7	
Rangpur	..	..	..	2·3	
Goalpara	..	..	4·1	2·8	Kachugaon 7·2″ on 27th.
Kamrup	..	..	2·7	2·4	
Garo Hills	..	..	3·2	3·7	
Khasi and Jaintia Hills.	..	..	6·3	5·3	Cherrapunji 17·4″, Mawsynram 9·9″ and Jowai 8·0″ on 27th; Cherrapunji 19·0″ on 28th.
Darrang	..	..	..	..	Orangajuli 7·3″ on 27th.

13. Madras cyclone from the 3rd to 14th October 1943.—On the morning of the 3rd October, it was found that light showers had occurred all along the east coast of India south of Chandbali and the upper winds along this coast had a marked cyclonic circulation, suggesting that a depression was probably forming out in the sea. Except for increased rainfall along the Ganjam coast there was no appreciable change in the situation on the 4th morning. However, by that evening weather deteriorated along the Coromandel and the Circars coasts and rainfall commenced at many stations in the interior of the Peninsula also. By the morning of the 5th the entire Peninsula had rain. A depression had probably formed with its centre at 0900 hrs. of that day near Lat. 13°N., Long. 84°E. Madras reported six inches of rain on the next morning and the available upper winds along the east coast showed considerable increase in strength. The depression had intensified into a cyclonic storm and was centred about 100 miles to the southeast of Madras at 0900 hrs. of the 6th. For the next three days the storm concentrated over the sea and its westward movement was very slow. Madras had 8 inches of rain by the 7th morning while only about one inch fell on each of the next two days. At 0900 hrs. of the 9th, the storm was centred about 50 miles to the southeast of Madras. At about noon Madras began to experience the fury of the storm; winds freshened into a gale and by 1800 hrs. it had 8 inches of rain. The storm was centred about 30 miles to the southeast of Madras at 1800 hrs. I.S.T. when the pressure defect at Madras was 6 mb. By about midnight the storm crossed the coast just to the south of Madras and weakened into a deep depression which was centred near Cuddapah on the 10th morning.

The depression rapidly moved across the Madras Deccan and Mysore and emerged into the Arabian Sea off the Kanara coast near Honavar on the same night. It was centred at 9 hrs. I. S. T. of the 11th near Lat. 14°N., Long. 73°E. At 0900 hrs. of the next day, the depression was centred near Lat. 16°N., Long. 70°E. Moving rapidly in the same direction it weakened and on the 13th morning lay as a shallow depression with its central region nearly 300 miles west of Bombay. The inrush of the continental air into the northern portion of the depression weakened it further and only a trough of low pressure lying over the central Arabian Sea could be found on the 0900 hrs. charts of the 14th.

The cyclonic storm caused high—and according to some, unprecedented—floods in the Madras city and its surroundings, widespread damage and suffering and a complete disorganisation of all activities in the city and its neighbourhood for a number of days. A large number of tanks burst, railway lines were washed away, power houses and pump houses were submerged, leading to failure of electric and water supply; entire streets were under water, transport at a standstill and communications by roads became

impossible. The river Cooum of Madras rose unprecedentedly, submerging several localities, and thirty to forty thousand people were rendered homeless. It is officially stated that 200 tanks were breached in the Chingleput district area. About 30 to 40 tanks were breached in the North Arcot District.

The rainfall (at Madras itself) associated with the disturbance is not without precedent; there has been another occasion in October when a maximum of 9·2″ was recorded—just a trifle more than that recorded at the observatory during this storm; apparently, however, the disastrous results were unusual. This was perhaps due to the already abundant rainfall which had fallen earlier in the year in the basins of the tanks and rivers. The total rainfall recorded for the five days ending the 10th at Mount Road (Madras) was 21 inches, while the observatory at St. Thomas Mount, a few miles to the south of the city proper, recorded only 15 inches.

Heavy floods were also reported from all over Mysore: the Kanwa, Arkavsthi, Turga and a number of smaller streams were in flood, causing damage to agriculture lands in the respective basins. A number of breaches of minor tanks occurred in Mysore also. It was reported that about 80 mud houses in Bangalore came down due to the heavy rain.

A note by Mr. B. N. Sreenivasiah on the weather experienced by him at the Forecasting Centre at Avadi (about 10 miles inland as the crow flies) and some of the peculiarities of the storm are given below :—

Weather at Avadi before, during and after the storm.

During the last few days of September and early days of October, a definite change in the weather was noticed to be taking place, indicating the change over to the transition type from the southwest monsoon type. For example, instead of thunderstorm development in the late afternoon or evening, rain in the early hours of the morning, frequent thunderstorms in the forenoon and early afternoon with clear skies in the evenings became the rule. Cloud movement changed over to become easterly and thunder between 1100 and 1200 became almost a daily occurrence.

A further change took place on the 3rd October in that the nights which used to be relatively clear and rainfree ceased to be so. On that day, the sky was heavily clouded up to 1430 hrs. and again after 1800 hrs. when thundery activity became pronounced. Rain, starting at 2200 hrs., continued till the small hours of the next morning, with heavy showers about midnight. Apart from short breaks up to 0800 hrs. rain continued intermittently throughout the 4th. The night was relatively clear but early on the 5th rain started again and went on until 1000 hrs. The day was marked by gusty winds but after 1000 hrs., apart from occasional showers, there was not much rain till 0100 hrs. of the 6th when continuous rain, with occasionally heavy falls, began. A heavy thunderstorm occurred at 0500-0600 hrs. and it continued to rain heavily till 1000 hrs. and intermittently thereafter till 1300 hrs. Skies continued to be threatening but no appreciable rain fell up to 2100 hrs. Heavy showers occurred about midnight. A regular downpour started at 0200 hrs. of the 7th and continued, with thunder and gusty winds. These were real rainsqualls. This (*i.e.* 7th) was a day on which there was every indication of the approach or proximity of a cyclonic storm. After 1100 hrs., there was some abatement in the rains but light rain continued until 1800 hrs. when there was a break but skies continued to be overcast and ugly. A noteworthy feature was the sudden drop of the wind from late afternoon onwards almost down to a calm—making one wonder (but for continued clouding and light rain and absence of changes in wind direction) whether the calm centre was over the station. The night continued to have slight rain or drizzle.

Rainy weather continued during the 8th but rain was not heavy. Early on the 9th, however, heavy rain commenced again but there was little wind. Vigorous rainsqualls commenced at 1215 and continued till 1800-1900 hrs. when the intensity of the rain slackened but squalls continued, reaching their maximum intensity at about 2200-2230 hrs. They suddenly decreased about midnight and skies began to clear. There was little rain after 2000 hrs. The morning of the 10th opened bright.

Some noteworthy points regarding meteorological elements associated with the storm as recorded at Madras and neighbourhood.

1. *Wind.—5-10-43.* Gusty winds during the afternoon. Gust reaching 24 m.p.h. (average 15 m.p.h.) at 1630 hrs. at the observatory and 19 m.p.h. at the harbour at the same hour. Wind direction (at observatory) NW to N.

6-10-43.—Squally from 0000 hrs. onwards—more markedly at the harbour. 28 m.p.h. (average 18 m.p.h.) at 0530 hrs. at harbour and 25 m.p.h. at 0550 hrs. at observatory. These squalls associated with NW winds changing to SW and W winds. Winds rather strong the whole day.

7-10-43.—Succession of squalls from 0000 hrs. onwards, reaching a speed of 34 m.p.h. at 1015 hrs. at the harbour and 33 m.p.h. at 0945 at the observatory. Irregular changes in wind direction at about 0400 hrs. Great increase of wind speeds during the late forenoon and afternoon. Average speed at harbour about 28 m.p.h., a gust reaching 48 m.p.h. at 1605 hrs. At observatory, speed average 18-20 m.p.h.; maximum gust 32 m.p.h. at 15 hrs. Sudden fall of wind at observatory after about 1600 hrs. to only 5 m.p.h. at night. At harbour, decrease more gradual but low velocities after 20 hrs. Wind direction (observatory) generally NNE to NW.

8-10-43.—Nothing very remarkable. NE winds at the observatory.

9-10-43.—Remarkably squally right from noon to late night. Succession of squalls shown by the records.

At the Madras Harbour, the wind reached the maximum speed of 57 m.p.h. at 23 hrs. 10 mins. of the 9th, the average speed at that time being 45 m.p.h. At the Nungumbakkam Observatory a couple of miles inland, the maximum velocity reached was 45 m.p.h. at 22 hrs. 45 mins. This reduction in the velocity is explicable by the inland situation of the Observatory but whether

the earlier (by 25 mins.) occurrence of the maximum squall at the observatory than in the Harbour is due to any errors in the clocks or whether it is due to a SW-NE inclination in the line of strongest winds, is difficult to say. Both at the harbour and at the observatory, winds died down by about 0300 hrs. of the 10th. At Avadi, even by about 0100 hrs. winds had moderated. The sky also cleared up rather rapidly, leaving the 10th morning to open brightly. It would thus appear that the core of the cyclone was rather small. The change from NE to SE winds took place at the Nungambakkam Observatory at 1630 hrs. of the 9th; the wind became SSE at 2230 hrs. and gradually changed to S at 0200 hrs. and SW at 0300 hrs. where it remained till late next day. There was clearly no "calm centre". It is also of interest to note that on the 9th, the rain mostly—in fact almost wholly—fell before the winds attained storm force and there was no rain at all when the squalls were at their maximum. The maximum intensity of the rain was at 1630 hrs. which was just the time when the inner storm area, the area of the strongest winds, began to touch Madras; no rain fell at all after about 1945 hrs.

2. *Rainfall.*—Greatest intensities of rain at Madras were :—

(i) Between 0145 and 0610 of 6-10-43.

(ii) Between 0100 and 0500 of 7-10-43.

(iii) Noon and 1845 hrs. of 9-10-43.

Much heavier rain fell at places in the interior some miles distant from the coast than on the coast itself. For instance, while St. Thomas Mount, Mount Road and Avadi (13 miles inland, probably only 10 miles as the crow flies) all recorded less than 10 inches of rain on the day of the heaviest rain, Conjeevaram some 30 miles inland is reported to have got 18 inches, Sriperambudur 16·38". Arkonam 10". It is of interest to note that Avadi (inland) got more rain than Madras City proper.

3. *Pressure.*—Pressure departures at the coastal stations were positive until the 6th morning when for the first time a negative departure of the order of 2 mb. appeared, maximum being near Cuddalore. The area of maximum negative departures shifted northward to Madras on 7th morning and increased further by the 8th morning to 2·5 mb. Even on the 9th morning it was only about 3·3 mb. Only on the 9th evening, *i.e.*, a few hours before the storm crossed did it really become somewhat considerable, *viz.*, 6 mb. Pressure changes only became pronounced and negative on 6th morning, but became positive on the 7th morning.

4. *Temperature and Humidity.*—The thermograph shows that there was a considerable rise of temperature with the coming on of the strong winds and the cessation of the major part of the rain on the 9th. From 1700 hrs. to 2245 hrs., there was a rise of 8 degrees Fahrenheit, followed by a rapid fall thereafter up to 0300 hrs., by when it fell 11° from the value at 2245 hrs. The relative humidity fell sharply at about 2000 hrs. and by 2245 hrs. had fallen to 85 per cent. from the original value of 100 per cent. The humidity rose after 2300 hrs.

The noteworthy district averages and particularly heavy amounts of rainfall are given in the following table :—

District	District averages recorded on						Particularly heavy falls (7" and above)
	6th	7th	8th	9th	10th	11th	
	"	"	"	"	"	"	
Nellore	..	2·5	3·4	..	2·1	..	Tada 11·7" and Sulurpet 9·9" on 7th; Tada 16·6", Sulurpet 11·2" and Atamkur 7·5" on 8th; Darsi 16·4" on 10th.
Chingleput	3·0	2·9	..	..	7·5	..	Satyavedu 7·4" on 8th; Conjeevaram 18·0", Sriperumbudur 16·4", Ponamallee 12·4", Covelang 12·1", Mahabalipuram 9·7", Uttiramerur 8·9", Saidapet 8·5", Cheyyur Anicut 8·1" and Cheyyur 7·9" on 10th.
Chittoor	..	..	..	..	3·9	..	
North Arcot	..	..	..	..	6·0	..	Arkonam 9·7", Ranipet 7·8", Ambur 7·7" and Vaniyambadi 7·1" on 10th.
Bangalore	..	..	..	..	4·0	..	
Kolar	..	..	..	..	3·2	..	
Tumkur	..	..	..	..	..	2·3	
Hassan	..	..	..	..	..	2·9	
Kadur	..	..	..	..	..	2·7	
Salem	..	..	..	..	2·1	..	
Trivandrum Division (Travancore State).	..	..	..	..	4·4	..	Pechippara 7·9" and Kallyal 7·5" on 10th.
South Kanara	..	..	..	..	..	3·4	Mulki 8·0" on 11th.

14. Bay cyclone of 14th to 20th October 1943.—On the morning of the 14th the isobaric situation and the cyclonic circulation over the southwest Bay suggested that conditions were becoming unsettled over that area. By the morning of the 15th, the unsettled conditions had probably developed into a depression with central region near Lat. 9°N., Long. 86°E.; the weather in Ceylon and in the Peninsula south of Lat. 12°N. had considerably deteriorated, Trincomalee and Negapatam reporting 4 and 3 inches of rain, respectively. The depression moved in a northwesterly direction and rapidly intensified into a cyclonic storm by 23 hrs. with its central region near Lat. 11°N., Long. 83°E. Moving in a northwesterly direction it was centred nearly 50 miles east of Nellore at 09 hrs. of the 16th when the negative pressure departure at Nellore was 9 mb. The rainfall recorded at Nellore for the past 24 hours was 10·5". The storm crossed the coast about 50 miles to the north of Nellore at about 1500 hrs. and subsequently weakened into a depression which was about 50 miles to the northwest of Nellore at 1800 hrs. On the morning of the 17th the depression was centred near Kurnool. The depression continued to move in a northwesterly direction during that day and was about 20 miles to the east of Bijapur by that evening; but by midnight it began to recurve and was centred between Ahmednagar and Parbhani on the 18th morning. It was near Pendra on the 19th morning, and became unimportant by the next day.

Associated with the cyclonic storm widespread and locally heavy rain fell over the south Peninsula between the 13th and 16th, on the north Madras coast on the 15th and 16th and in the Deccan and parts of the Central Provinces and Central India from the 17th to 19th; local thundershowers occurred in the east United Provinces and Bihar on the 20th.

Some of the notable amounts of rainfall and district averages were :—

District	District averages recorded on					Particularly heavy falls (5″ and above)
	15th	16th	17th	18th	19th	
	″	″	″	″	″	
Vizagapatam	..	2·3	2·2	..	..	Vizagapatam 6·6″ on 16th.
East Godavari	..	3·0	..	..	..	
West Godavari	..	2·0	..	..	..	Tanuku 5·7″ on 16th.
Kistna	..	..	2·1	..	..	Kodur 5·8″ on 16th.
Nellore	..	3·2	..	..	..	Nellore 10·5″, Sangam 8·8″, Surveypulli 7·5″, Buchireddipalem 7·3″, Gudur 6·5″, Sulurpet 6·1″, Tada 5·8″ and Nellore Anicut 5·7″ on 16th; Udayagiri 6·0″ on 17th.
Chingleput	..	3·5	..	..	..	Vayalur 6·1″ on 16th.
Chittoor	..	1·9	..	..	..	Kalahasti 5·9″ on 16th.
Pudukkottai	2·1	..	..	..	..	
Raichur	..	..	2·7	..	..	
Cuddapah	..	..	..	..	..	Vallur 5·9″ on 16th.
Kurnool	..	..	..	..	..	Atmakur 5·2″ on 17th.
Bir	..	..	2·1	1·9	..	
Ahmednagar	..	..	..	2·7	..	
East Khandesh	..	..	..	2·5	1·9	
Indore	..	..	..	..	2·3	Anjor 5·9″ on 18th.
Bhopal State	..	..	..	..	2·4	
Southern C. I. States Agency.	..	..	..	2·8	..	Dharampuri 5·4″ and Niwali 5·7″ on 18th.
Hoshangabad	..	..	..	..	2·7	
Nimbory	..	..	..	..	3·2	
Raipur	..	..	..	..	..	Raipur 7·7″ on 18th.
Khandwa	..	..	..	..	..	Khandwa 5·7″ on 19th.

15. Bay storm of 27th October to 2nd November 1943.—On the evening of the 27th October upper winds at Trincomalee at 1·5 km. and above indicated that conditions may become unsettled in the south Bay. Upper wind between 1 and 2 km. became NW-ly at Madras and Trichinopoly on the 29th morning. These together with the isobaric situation suggested that a depression had probably formed in the central Bay with central region near Lat. 14°N., Long. 86½°E. In the afternoon upper winds over Vizagapatam at 1 km. and above were 30 to 40 m.p.h. in strength. The pressure charges and the isobars along the east coast at 18 hrs. of the 29th suggested that the disturbance was centred near Lat. 16°N., Long. 85½°E., and that it had probably intensified into a cyclonic storm. At 9 hrs. of the next day the storm was near Lat. 17°N., Long. 85°E. Moving in a northwesterly direction the storm was about 30 miles to the southsoutheast of Calingapatam at 09 hrs. of the 31st. The pressure defect at Calingapatam was 15 mb., and even then there was no bad weather (past or present) at any station along the east coast of India south of Gopalpur. Now the storm which had only a narrow core became severe and moving westwards crossed the coast between Calingapatam and Vizagapatam at about 1800 hrs. After crossing the coast the storm weakened into a depression. Moving westsouthwestwards it weakened further and lay over the south Deccan as a shallow low pressure area on the morning of the 1st November. It passed on into the Arabian Sea as a low pressure wave on the 2nd and became unimportant there by the 3rd morning.

Considerable damage to property and some loss of life of men and cattle occurred on the 31st at Chicacole, Narasannapetta, Calingapatam and a number of villages on the coast all lying within a width of less than 20 miles. Almost all the houses in Chicacole suffered damage and most of the thatched houses were destroyed. It is estimated that on the whole the town suffered a damage to the extent of Rs. 8 lakhs. At Calingapatam a tidal wave swept into the town and this combined with floods in the Vamsadhara river caused great damage. Crops especially sugarcane in Bobbili and Palakonda talukas were affected. Eight persons were reported to have been killed. The observatory at Calingapatam was also damaged and telegraphic communication cut off. In the Ganjam district of Orissa some damage was caused to the crops.

This storm gave slight rain on the Orissa and south Bengal coasts on the 29th on the Orissa coast on the 30th and local rain on the north Madras coast on the 31st and 1st. Some of the district averages and particularly heavy amounts of rainfall are given below :—

District	District averages recorded on			Particularly heavy falls (5″ and above)
	31st Oct.	1st Nov.	2nd Nov.	
	″	″	″	
Koraput	..	1·9	..	
Ganjam	..	..	..	R. Udayagiri 5·5″ on 31st.
Vizagapatam	..	3·1	..	Pundi 6·0″ on 31st; Pundi 10·0″, Tekkali 7·5″, Palakonda 6·8″ and Narasannapetta 6·5″ on 1st November.

16. Arabian Sea depression on the 14th to 18th November 1943.—Simultaneous with the development of the unsettled conditions in the southwest Bay weather became unsettled in the east central Arabian Sea on the 14th morning and a trough of low pressure probably developed off the Kanara-Konkan coast. On the 15th morning a circulation was observed over the east central Arabian Sea up to 6 km.; the negative pressure departures became more pronounced along the Konkan-Kathiawar coasts and a low pressure area had developed off these coasts. The 'low' intensified into a depression centred within a degree of Lat. 16°N., Long. 70°E. on the 16th morning but weakened into a shallow low pressure area on the 17th with central region near Lat. 18°N., Long. 70°E. It further weakened, moved westwards and became unimportant by the next day.

The depression caused fairly widespread rain in Malabar between the 15th and 18th. The district averages for the 17th were :—Cochin State 2·6″ and Malabar 3·2″. The noteworthy heavy falls were : 16th Shertalai 5·6″, 17th Payyanur 11·5″, Irikkur 7·5″, Taliparamba 7·8″, Badagara 5·1″, Kuttiyadi 5·4″, Quilandi 5·4″, Irritty 5·5″ and Hosdrug 9·1″.

17. Bay depression on the 18th to 22nd November 1943.—In the isobaric chart of 0900 hrs. of the 18th November a shallow low was found to exist over the southwest Bay off the east coast of Ceylon. There was no appreciable change in the situation for the next two days. By the 20th morning weather in Ceylon and along and near the Coromandel coast had however considerably deteriorated. The

available upper winds in that area were also showing a well-marked cyclonic circulation suggesting that a depression had probably developed in the southwest Bay with its central region near Lat. 8½°N., Long. 86½°E. at 09 hrs. of the 20th. Moving in a westnorthwesterly direction the depression was centred near Lat. 10°N., Long. 84°E. at 09 hrs. of the 21st.. Thereafter the depression took a more westerly course and moved about a degree westwards by the evening. By the next morning the depression became rather shallow. At 09 hrs. it was centred about 50 miles to the east of Negapatam and rapidly moved inland by 15 hrs. Subsequently it weakened further and lay in the evening as an extended trough of low pressure over southeast Madras and the adjoining parts of the southeast Arabian Sea. By the next morning the trough passed over into the Arabian Sea and was causing unsettled weather off Malabar. By the next day weather improved off Malabar and the trough had moved westwards as a low pressure wave.

Associated with the depression a spell of wet weather prevailed over southeast Madras, the Madras Deccan in and near Mysore, Malabar and Ceylon between the 20th and 23rd the rainfall being moderate to heavy in parts of southeast Madras and the Madras Deccan. The district averages of the rainfall were : 21st Chingleput 3·2″, 22nd Chingleput 1·6″, North Arcot 1·5″, South Arcot 2·2″, Trichinopoly 1·6″ and Cuddapah 2·4″. Some of the heavy falls were : 21st Vallur 8·3″, Voyallur 6·2″, Ponneri 7·5″, Saluavedu 6·9″ and Tada 5·5″ ; 22nd Vanur 6·5″.

II.—WESTERN DISTURBANCES.

A list of western disturbances (47 in number) together with a brief summary of the precipitation caused by them is given in the Table. Details of individual disturbances are given in the Monthly Weather Reports for the different months.

Table.

—	January	February	March	April	May	June	July	August	September	October	November	December
Widespread Precipitation	1	2	2	1	1	0	0	0	0	0	0	1
Local or scattered precipitation	5	3	4	5	2	1	1	0	0	0	1	2
Little or no rain	0	1	1	2	2	0	0	0	0	1	4	4
TOTAL	6	6	7	8	5	1	1	0	0	1	5	7

Total western disturbances in 1943 47

The descriptions of the more important western disturbances are given below :—

1. Western disturbance between the 28th December 1942 and 7th January 1943.—An active western disturbance was approaching Iraq and the head of the Persian Gulf on the morning of the 28th December when the upper winds over Bahrein were southerly force 10-15 m.p.h. up to 1·5 km. By the evening the disturbance was passing across Iran and Ispahan recorded ¼″ of rain. It began to affect the northwest frontier and Baluchistan with a secondary over the Gulf of Oman on the next day. Showers and strong winds continued in the Persian Gulf, Gulf of Oman and Baluchistan. By the 31st morning widespread precipitation occurred along the northwest frontier and in Kashmir and a well-marked discontinuity of wind-field appeared over Baluchistan and the extreme north of the country up to 1·5 km. Pressure was rapidly falling in northwest India and in the west Central Provinces. Thundershowers along the Mekran coast and thundershowers or snowstorms continued along the northwest frontier and in Kashmir. Jiwani recorded 2″ of rain on the 31st evening. The disturbance caused fairly widespread precipitation in northwest India outside west Rajputana and Gujarat till the 4th January and passed away across the United Provinces hills on the 7th causing widespread precipitation in the Punjab-United Provinces hills on the 5th.

2. Western disturbance between the 7th and 13th January 1943.—Pressure began to fall rapidly in Iran and the head of the Persian Gulf on the 7th morning indicating the approach of an active western disturbance. By the evening clouds appeared over Iran which extended to the east Persian Gulf and rain commenced in Bushire. On the next morning the disturbance began to affect Baluchistan and northwest India. On the 10th morning a well-marked low with a steep pressure gradient appeared in the northwest frontier. By the evening of the 10th rain started along the Mekran coast and extended to the northwest frontier and widespread precipitation occurred in the North-West Frontier Province, Kashmir and the Punjab on the 11th. The disturbance then moved away rapidly eastwards and became unimportant on the 13th after causing fairly widespread precipitation along the sub-Himalayan regions from Kashmir to Assam on the 12th.

III.—LOCAL STORMS.

Some of the noteworthy local storms reported in newspapers are given below :—

Place	Date	Time	Character of storm	Loss of human life	REMARKS
Brahanpur (Gorakhpur District).	April 20	..	Severe storm	·2	23 people under a hut were hurt by lightning.
Dhubri, Gauripur and neighbouring villages.	April 29	Evening	Storm	*nil*	Six boats conveying paddy and jute sunk. Many thatched houses razed to the ground.
Poona	May 2	Evening	Thunderstorm	*nil*	Telephone posts and trees uprooted and roofsheets blown off.
Poona	May 3	6 P.M.	Hailstorm	3	Some hailstones were as big as groundnuts. Mango crop in the neighbourhood spoiled. Train services stopped between Bombay and Poona.
Benares	May 9	Night	Thunderstorm	*nil*	Telegraph and telephone communications cut off. Electric supply cut off. Followed by heavy downpour of rain.

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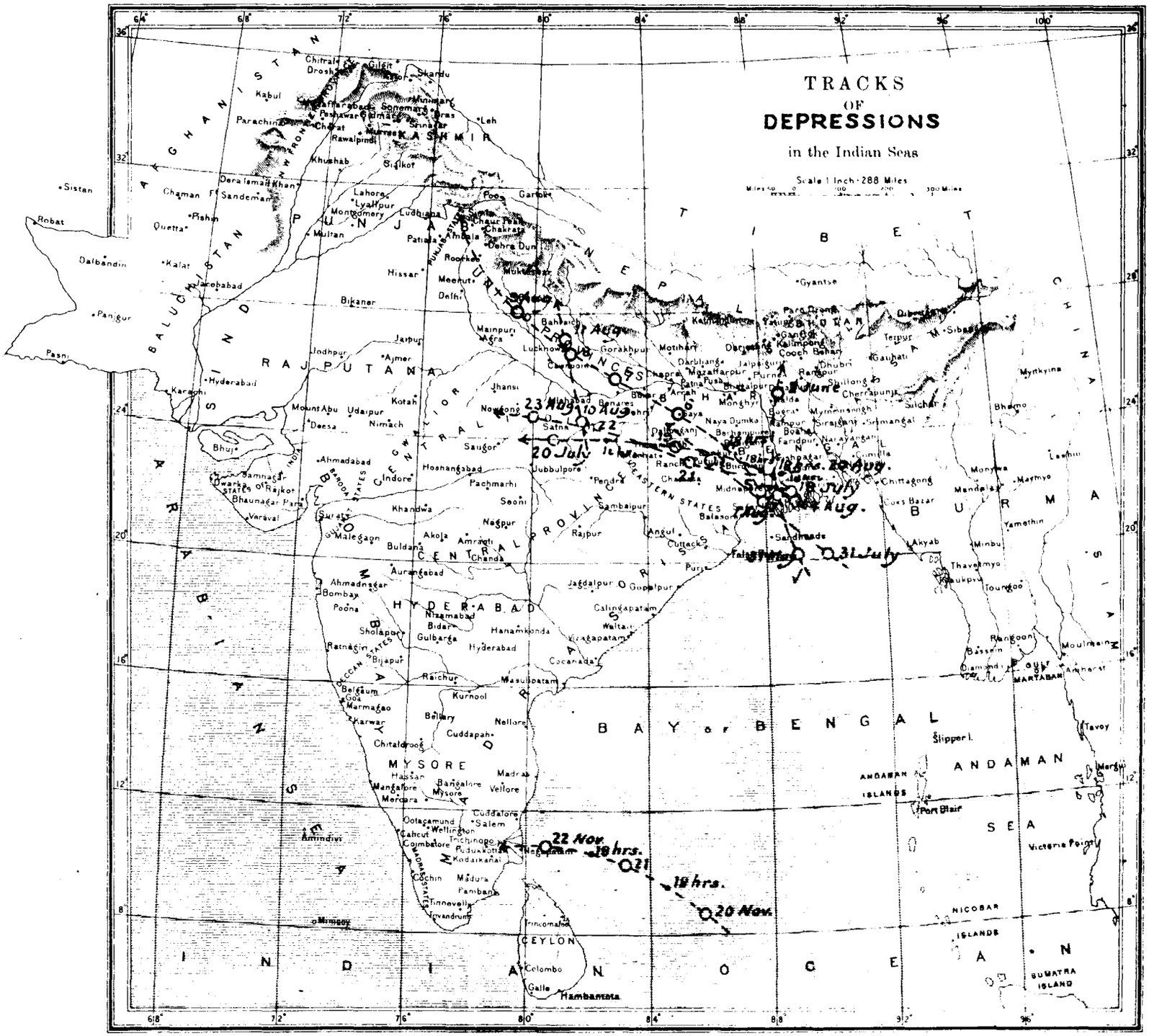

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